We investigate the immunization level required to halt the propagation of an online meme whose basic reproduction nu
Introduction The mitigation of contagion processes on networks has been studied extensively over the last two decades.
We derive closed-form threshold conditions for (a) purely random vaccination and (b) vaccination restricted to degree k
Methodology Network construction To satisfy $z = 3$ and $q = 4$ simultaneously in the absence of degree correlations, a d
[b] Generation of synthetic contact network [1] Set population size $N = 10^4$. Draw $N(1-\phi)$ degrees from a Poisson dis
Epidemic model A standard SIR process with per-contact infection rate β and recovery rate $\gamma = 1$ was implemented wi
Vaccination scenarios and initial conditions **Scenario A**: random vaccination. A fraction f of nodes is switched to stat
Simulation settings For each scenario three stochastic realisations were run up to $t = 100$ time units. Compartment cou
Analytical Results Random vaccination threshold Random removal of a fraction f of nodes scales the mean excess degr

Thus 75% random coverage is required.

Vaccination confined to degree $k = 10$ nodes Let P_{10} be the proportion of degree-10 vertices in the untreated graph. Re

leading to $R_0(\alpha) = \beta q(\alpha)$. Substituting the Poisson backbone with $z = 3$ gives $P_{10} \approx 8.1 \times 10^{-4}$. Even for $\alpha = 1$ we obtain
Simulation Results Key outcome metrics are summarised in Table . Vaccinating 75% of the population at random still

[h] Outcome metrics from FastGEMF simulations

Scenario	Peak I/N	Final R/N
Random $f = 0.75$	1.02×10^{-2}	7.66×10^{-1}
All degree-10 vaccinated	1.06×10^{-2}	1.42×10^{-1}

[http] [width=0.48]results-11.png [width=0.48]results-12.png Epidemic trajectories for (left) 75% random vaccination ar
Discussion The analytical percolation framework predicts that random vaccination at $f_c = 0.75$ should suffice. Our nun
Conversely, degree-targeted vaccination restricted to $k = 10$ nodes provides limited leverage despite its conceptual appe
Conclusion Random immunisation demands a theoretical 75% coverage to halt a meme with $R_0 = 4$ on the studied net
*References 9

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Y. Liu extitet al., "Efficient network immunization under limited knowledge," *Natl. Sci. Rev.*, vol. 8, 2020.